

# Chapter 2 Part G:






## Transmission

Refer to the beginning of Chapter 1 for model identification details

### Contents

|  |   |  |   |
|--|---|--|---|
| Clutch and driven pulley – removal, inspection and installation . . . . .  | 4 | General information . . . . .  | 1 |
| Drive pulley and variator – removal, inspection and installation . . . . . | 3 | Drivebelt and support roller – inspection and renewal . . . . .                | 5 |
| Gearbox – removal, inspection and installation . . . . .                   | 6 | Drivebelt cover and kickstart – removal, inspection and installation . . . . . | 2 |

### Degrees of difficulty

|   |  |  |   |  |
|---|--|--|---|--|
| <b>Easy</b> , suitable for novice with little experience<br> | <b>Fairly easy</b> , suitable for beginner with some experience<br> | <b>Fairly difficult</b> , suitable for competent DIY mechanic<br> | <b>Difficult</b> , suitable for experienced DIY mechanic<br> | <b>Very difficult</b> , suitable for expert DIY or professional<br> |
|---|--|--|---|--|

### Specifications

#### Variator

|  |           |
|--|-----------|
| Roller diameter (min)                            |           |
| 50 cc, 80 cc, 100 cc and 125 cc models . . . . . | 18.5 mm   |
| 200 cc models . . . . .                          | 20.0 mm   |
| Collar diameter (min)                            |           |
| All 50/80/100 cc models . . . . .                | 19.95 mm  |
| ET4 125, Sfera 125, Liberty 125 . . . . .        | 21.90 mm  |
| Typhoon 125, Skipper, Hexagon . . . . .          | 25.93 mm  |
| LEADER models . . . . .                          | 25.95 mm  |
| Bush diameter (max)                              |           |
| 50/80 cc two-stroke engines . . . . .            | 26.10 mm  |
| 50/100 cc four-stroke engines . . . . .          | 20.12 mm  |
| ET4 125, Sfera 125, Liberty 125 . . . . .        | 22.035 mm |
| Typhoon 125, Skipper, Hexagon . . . . .          | 26.10 mm  |
| LEADER models . . . . .                          | 26.12 mm  |

#### Clutch and driven pulley

|   |           |
|---|-----------|
| Clutch drum diameter (max)                                    |           |
| All 50/80/100 cc models . . . . .                             | 107.5 mm  |
| ET4 125, Sfera 125, Liberty 125 . . . . .                     | 120.6 mm  |
| Typhoon 125, Skipper, Hexagon, LEADER models . . . . .        | 134.5 mm  |
| Clutch drum out-of-round (max)                                |           |
| LEADER models . . . . .                                       | 0.15 mm   |
| all other models . . . . .                                    | 0.20 mm   |
| Inner pulley shaft diameter (min)                             |           |
| All 50/80/100 cc models . . . . .                             | 33.96 mm  |
| ET4 125, Sfera 125, Liberty 125 . . . . .                     | 40.955 mm |
| Typhoon 125, Skipper, Hexagon, LEADER models . . . . .        | 40.96 mm  |
| Outer pulley bore diameter (max)                              |           |
| All 50/80/100 cc models . . . . .                             | 34.08 mm  |
| ET4 125, Sfera 125, Liberty 125 . . . . .                     | 41.035 mm |
| Typhoon 125, Skipper, Hexagon, LEADER models . . . . .        | 41.08 mm  |
| Spring free length (min)                                      |           |
| All 50/80/100 cc models . . . . .                             | 110 mm    |
| ET4 125, Liberty 125 . . . . .                                | 127 mm    |
| Sfera 125 . . . . .   | 121 mm    |
| Typhoon 125, Skipper, Hexagon . . . . .                       | 136 mm    |
| LEADER models . . . . .                                       | 106 mm    |
| Clutch lining material thickness (min) - all models . . . . . | 1 mm      |

**Drivebelt**

|                                 |         |
|---------------------------------|---------|
| Minimum width of outer run      |         |
| All 50/80/100 cc models         | 17.5 mm |
| ET4 125, Sfera 125, Liberty 125 | 17.2 mm |
| Typhoon 125, Skipper, Hexagon   | 21.0 mm |
| LEADER models                   | 21.5 mm |

**Torque settings**

|   |             |
|---|-------------|
| Kickstart lever pinch-bolt                      | 12 to 13 Nm |
| Drivebelt cover screws                          | 11 to 13 Nm |
| Drivebelt support roller centre bolt            | 11 to 13 Nm |
| Drive pulley nut                                |             |
| 50/80 cc two-stroke models                      | 40 to 44 Nm |
| 50/100 cc four-stroke models                    | 20 Nm +90°  |
| ET4 125, Sfera 125, Liberty 125                 | 40 to 44 Nm |
| Skipper, Hexagon, Typhoon 125, LEADER           | 75 to 80 Nm |
| Clutch assembly nut                             |             |
| 50/80 cc models with gearbox behind clutch      | 40 to 44 Nm |
| 50/100 cc models with gearbox behind rear wheel | 55 to 60 Nm |
| All 125 cc models                               | 55 to 60 Nm |
| LEADER models                                   | 55 to 60 Nm |
| Clutch drum nut                                 |             |
| 50/80/100 cc two and four-stroke models         | 40 to 44 Nm |
| 125 cc two-stroke models                        | 50 to 56 Nm |
| ET4 125, Sfera 125, Liberty 125                 | 40 to 44 Nm |
| Gearbox input shaft nut                         |             |
| LEADER models                                   | 54 to 60 Nm |
| Gearbox cover bolts                             |             |
| 50/80 cc models with gearbox behind clutch      | 11 to 13 Nm |
| 50/100 cc models with gearbox behind rear wheel | 24 to 26 Nm |
| All 125 cc two-stroke models                    | 13 to 15 Nm |
| ET4 125, Sfera 125, Liberty 125                 | 11 to 13 Nm |
| LEADER models                                   | 24 to 27 Nm |

**1 General information**

The transmission on all models is fully automatic in operation. Power is transmitted from the engine to the rear wheel by belt, via a variator on the drive pulley, which automatically varies the gearing with engine speed, an automatic clutch on the driven pulley, and a reduction gearbox. Both the variator and the automatic clutch work on the principal of centrifugal force.

**Note:** On some models the internal components of the transmission may differ slightly to those components described or

shown. When dismantling, always note the fitted position, order and way round of each component as it is removed.

**2 Drivebelt cover and kickstart – removal and installation**

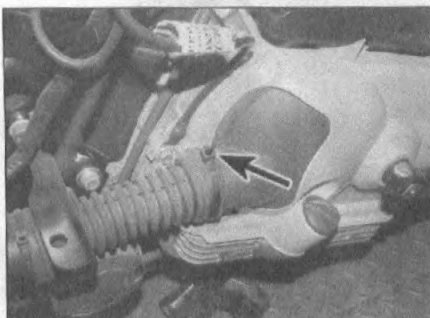
**Removal**

- 1 If the engine is still in the frame, remove any bodywork as required to access the drivebelt cover on the left-hand side of the engine (see Chapter 7).
- 2 Remove the air filter housing (see Chapter 4).

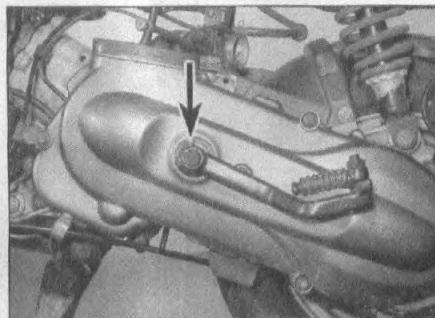
3 Release the rear brake cable and, where appropriate, the throttle cable from its clips on the drivebelt cover. Where fitted, detach the air cooling duct from the front of the cover (see illustration).

4 On Hexagon models fitted with a plastic trim over the drivebelt cover, remove the kickstart lever pinch-bolt and draw the lever off the shaft, then remove the bolts securing the plastic (see illustrations). Refit the kickstart lever to the shaft – this is to prevent the shaft being accidentally knocked through the cover and dislodging the mechanism return spring.

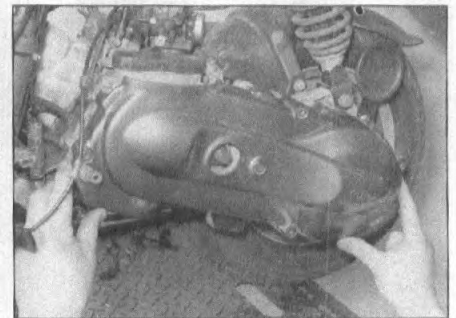
5 On later models and LEADER engined models, the gearbox input shaft passes through the drivebelt cover and is supported



2.3 Cut the cable tie (arrowed) and detach the air duct

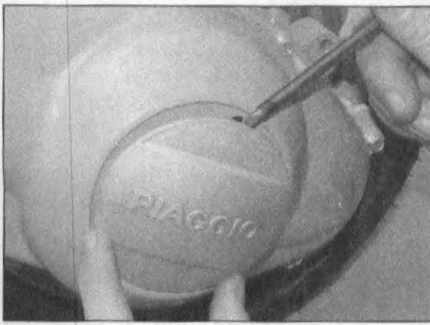


2.4a Remove the pinch-bolt (arrowed) and slide off the kickstart lever

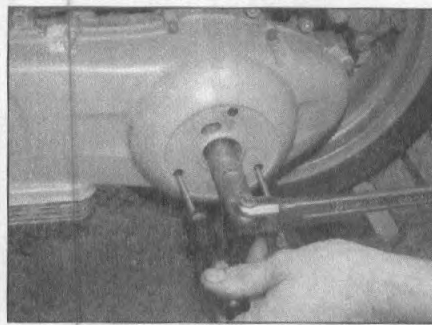


2.4b Unscrew the bolts and remove the trim cover

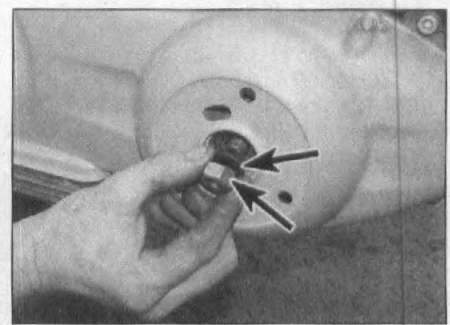




2.5a Remove the plastic cap



2.5b Lock the clutch drum as described ...



2.5c ... and remove the nut and washer (arrowed)

by a bearing in the cover. To undo the nut on the outer end of the shaft, first unclip the plastic cap on the clutch bearing housing (see illustration). The clutch drum must be locked against the belt cover to prevent the shaft turning while the nut is undone; Piaggio produce a service tool (Part No. 020423Y) to do this. Alternatively, insert two large screwdrivers through the holes in the belt cover to engage the holes in the clutch drum and have an assistant hold the screwdrivers while the nut is undone, then remove the nut and washer (see illustrations). On LEADER engine models, remove the oil filler cap (see illustration).

6 Unscrew the bolts securing the drivebelt over, noting the position of the clips on the bolts, then remove the cover, noting how it fits (see illustration). On models where the

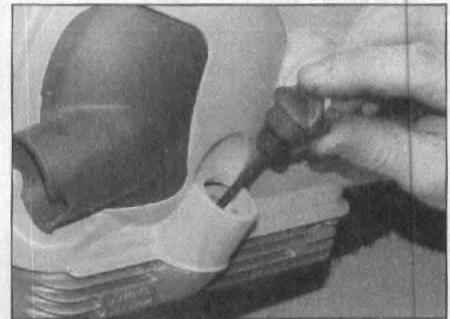
gearbox input shaft passes through the belt cover, note the spacer on the shaft (see illustration).

7 On 50 cc four-stroke models, a spring clip secures the end of the gearbox shaft in the cover bearing (see illustration). Note the position of the clip but do not remove it unless it is damaged and needs to be renewed.

### Inspection

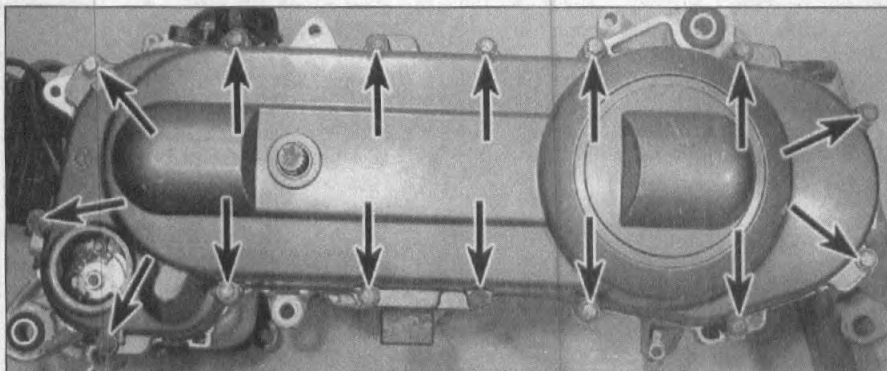
**Note:** It is not advisable to disassemble the kickstart mechanism unless a component needs to be renewed – the return spring can be very difficult to fit.

8 Where fitted, remove the kickstart mechanism cover on the inside of the belt cover (see illustration). Remove any old and hardened grease. Manually operate the lever and check that the mechanism operates



2.5d Remove the oil filler cap

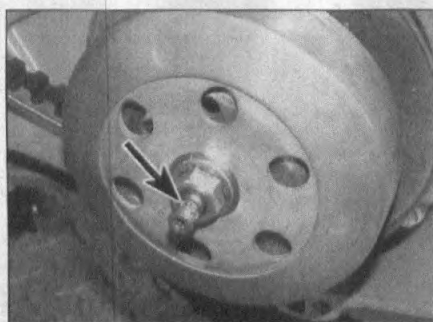
smoothly and returns to its rest position under pressure of the spring. Check for any signs of wear or damage on the pinion teeth, and check for rounded dogs on the engaging pinion and its corresponding plate on the drive pulley (see illustration).



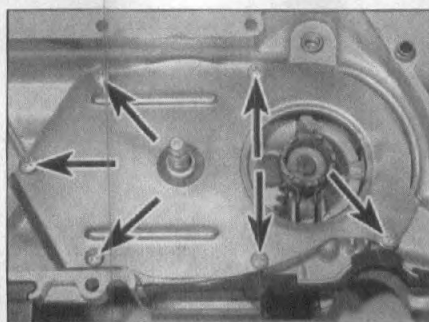
2.6a Transmission cover bolts (arrowed) – Typhoon



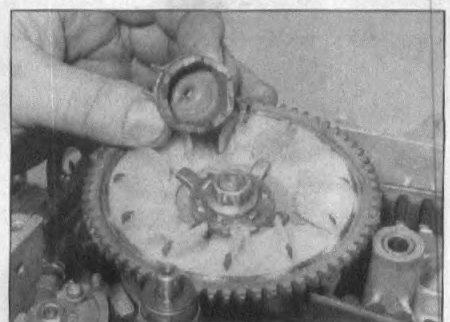
2.6b Note the spacer on the gearbox shaft



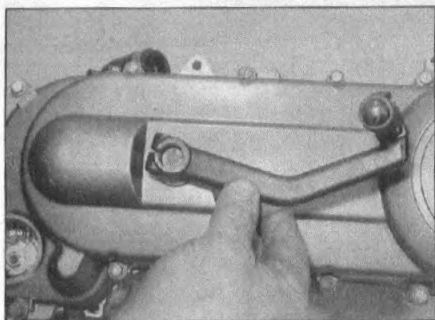
2.7 Note the spring clip (arrowed) on the gearbox shaft



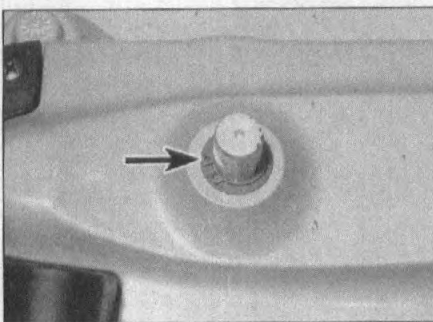
2.8a Where fitted, remove the screws securing the kickstart mechanism cover (arrowed)



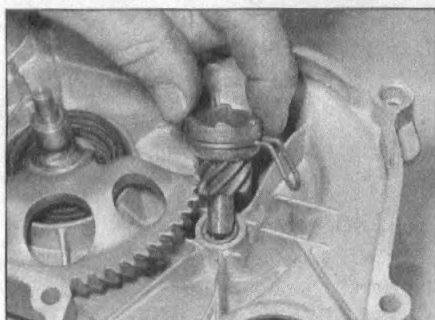
2.8b Check the engaging pinion dogs and their mating plate for wear and damage



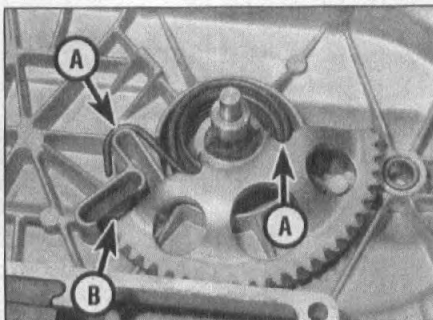
2.9a Unscrew the bolt and remove the kickstart lever



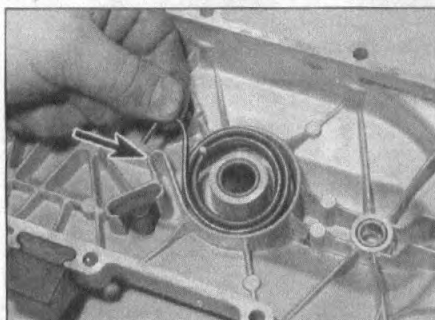
2.9b Remove the circlip (arrowed) securing the shaft



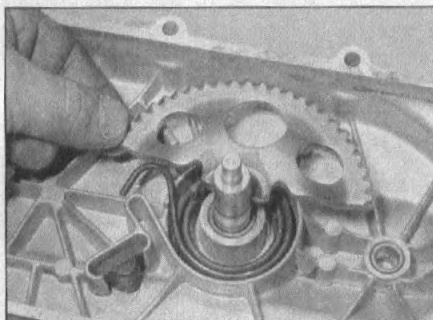
2.9c Remove the engaging pinion, noting how it fits



2.9d Note how the spring ends (A) locate, and how the pinion butts against the rubber pad (B)



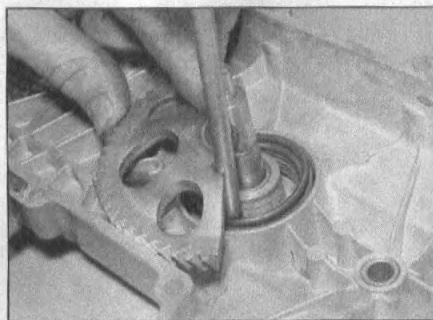
2.11a Fit the return spring, locating its hooked end against the raised section (arrowed)



2.11b Install the pinion as shown . . .



2.11c . . . then locate the steel rod onto the spring end and against the pinion . . .



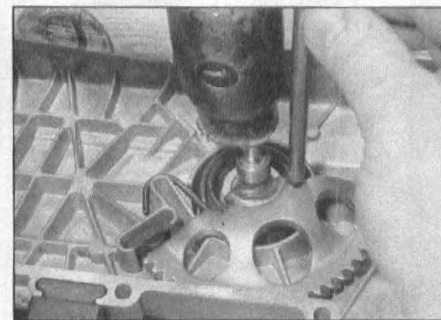
2.11d . . . and move the pinion around, bringing the spring with it . . .

9 If the kickstart action is suspect or if any components are damaged, first remove the kickstart lever pinch-bolt and draw the lever off the shaft (see illustration). Where fitted, remove the circlip securing the shaft in the cover (see illustration). Lift the engaging pinion out of the cover, noting how it is located by its spring clip (see illustration). Note how the shaft pinion return spring ends are located on the pinion and the casing, and note how the pinion butts up against the rubber pad under spring pressure. Pull the shaft out of the cover carefully; the spring will release its tension and uncoil as the end detaches from the pinion (see illustration). Remove the spring.

10 Clean all components in solvent. Check the spring for cracks and distortion and the shafts and their bushes in the cover for wear. Check the condition of the rubber pad. Renew any components that are worn or damaged.

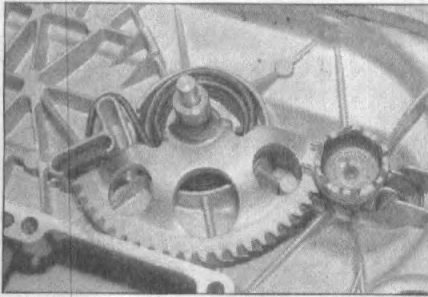
11 To reassemble the mechanism, first install the pinion return spring, locating its hooked end against the raised section in the cover (see illustration). Apply some grease to the kickstart shaft and its bore. Fitting the shaft pinion and tensioning the return spring can be difficult. Piaggio produce a service tool (Part No. 020261Y) for this purpose. Alternatively, obtain a length of steel rod and drill a hole up one end deep enough to accommodate the upturned end of the return spring. Locate the pinion in its bore, with the cutout in the pinion adjacent to the end of the spring, then fit the drilled rod over the end of the spring (see illustrations). Hold the rod against the pinion and use the rod to turn the pinion anti-clockwise so that the spring is tensioned. When the pinion clears the rubber pad, press or tap it down into its installed position, so that it butts against the pad (see illustrations). Pull the rod off the spring end, which will automatically locate itself in the cutout in the pinion.

12 Apply some grease to the engaging pinion shaft and fit it into its bore (see illustration 2.9c), locating the spring clip end as



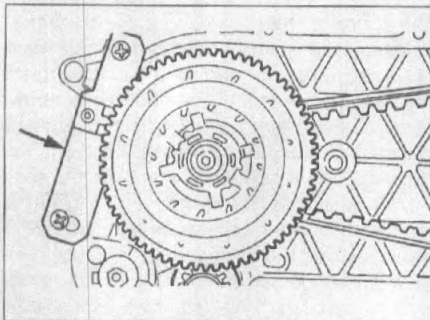
2.11e . . . until the pinion end clears the rubber pad and can be tapped down against it



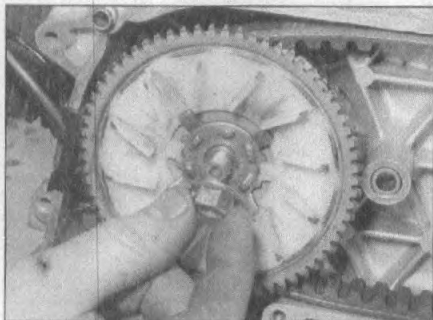


2.12 The installed assembly should be as shown, though on some models the engaging spring end locating section is positioned differently

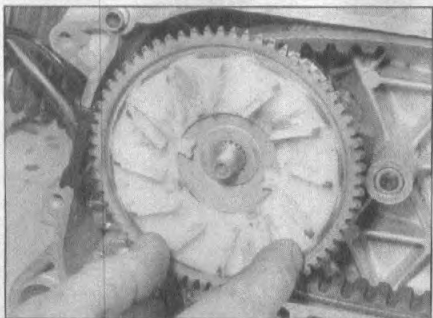
shown (see illustration). Secure the kickstart shaft with the circlip, where fitted (see illustration 2.9b). Fit the kickstart lever and tighten the bolt to the specified torque (see illustration 2.9a). Check the operation of the mechanism. Where fitted, install the mechanism cover (see illustration 2.8b).



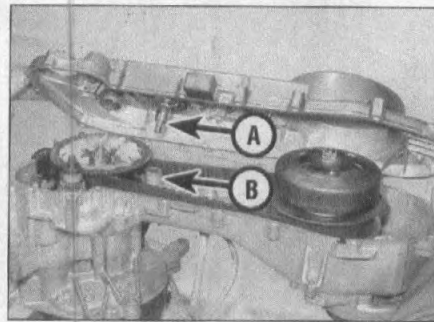
3.2a Piaggio tool (arrowed) used to lock drive pulley



3.2c Remove the nut . . .

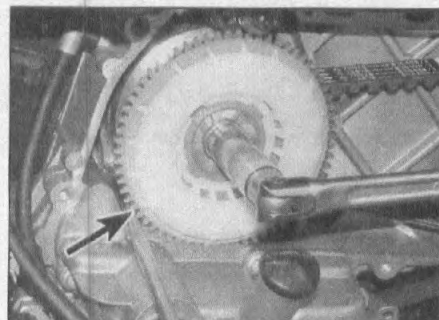


3.2e . . . the finned plate . . .

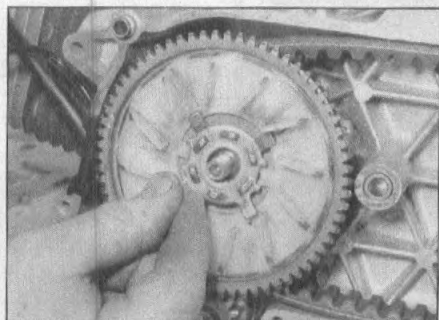


2.14 Where applicable, make sure the shaft (A) locates in its bore (B)

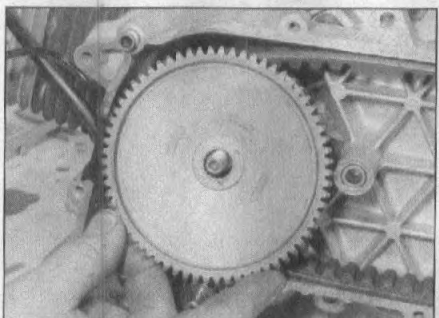
13 Where fitted, check the condition of the bearing in the cover. The bearing should turn smoothly and freely without excessive play between the inner and outer races. If there is any doubt about the condition of the bearing, replace it with a new one. On models where the gearbox shaft passes through the cover, remove the retaining circlip on the inside of



3.2b Lock the starter driven gear with a screwdriver (arrowed)



3.2d . . . the mating plate . . .



3.2f . . . and the starter driven gear

the cover, then press the bearing out from the outside with a driver or suitably sized socket. If necessary, heat the cover on the inside around the bearing housing with a hot air gun to aid removal. Note which way round the bearing is fitted. Drive the new bearing in with a socket that contacts the outer race only, then fit the circlip. On some two-stroke models, the bearing locates in a blind hole in the cover and must be removed with a bearing puller and slide hammer. Alternatively, heat the cover around the bearing housing, then tap it face down on the work surface to dislodge the bearing. Take care to avoid damaging the surface of the cover's edge.

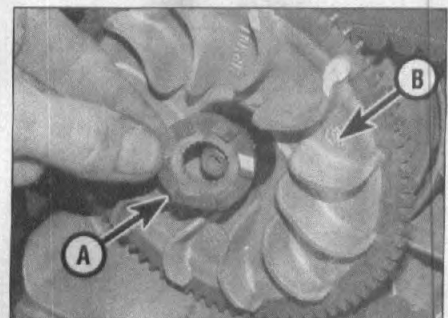
### Installation

14 Installation is the reverse of removal. Ensure the kickstart shaft end locates correctly in its bore next to the drive pulley where applicable (see illustration). On models where the gearbox input shaft passes through the belt cover, ensure the spacer is in place on the shaft before fitting the cover (see illustration 2.6b). Employ the method used on removal to prevent the shaft turning, then fit the washer and tighten the input shaft nut to the specified torque.

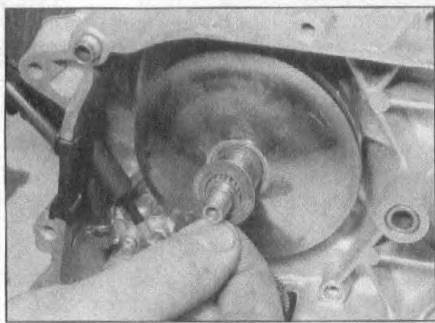
### 3 Drive pulley and variator – removal, inspection and installation

#### Removal

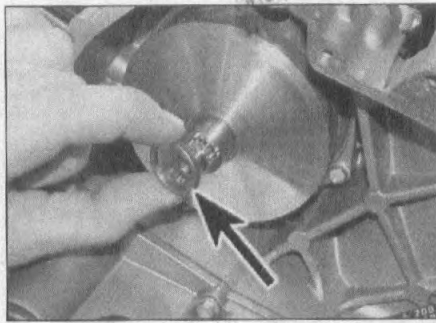
1 Remove the drivebelt cover (see Section 2).  
2 To remove the drive pulley nut, the pulley must be locked to prevent it turning. Piaggio produce a service tool (Part No. 020165Y or 020451Y depending on model) which bolts onto the engine case and has a toothed section which locates into the drive pulley (see illustration). A similar home-made tool can be made. Alternatively, locate a large flat-bladed screwdriver between the teeth of the starter driven gear and hold it firmly against the engine casing (see illustration). With the pulley locked, unscrew the nut and remove the kickstart engaging pinion mating plate, the plastic finned plate (where fitted) and the starter driven gear (see illustrations). Piaggio



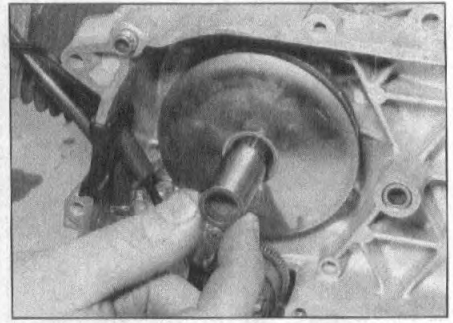
3.2g Starter mating plate (A) and driven gear (B) on X9 LEADER engine



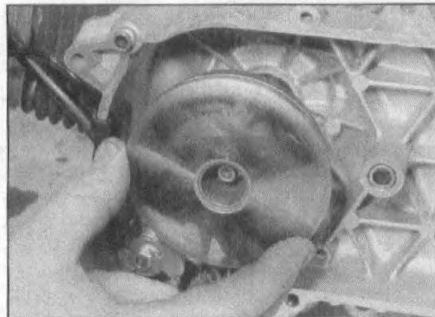
3.3a Remove the washer ...



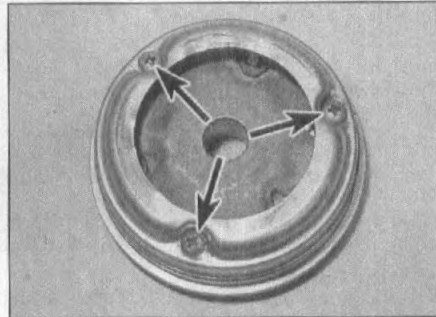
3.3b ... or spacer (arrowed)



3.3c Draw out the collar ...



3.3d ... and slide the variator off the shaft



3.4a On early models remove the screws (arrowed) ...

recommend that a new nut is used on assembly.

**3** Move the drivebelt aside, and remove the washer from the end of the shaft or the spacer from off the collar, then draw out the collar and slide the variator off the shaft (see illustrations).

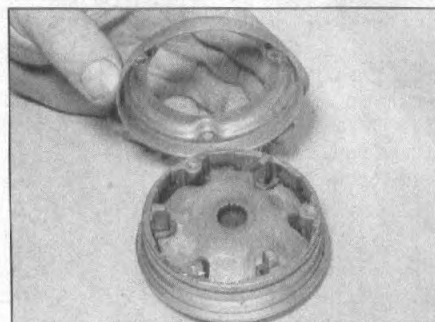
**Note:** Two types of variator are fitted; on early models the variator rollers are greased and the variator has a cover, on later models the rollers are not greased and no cover is fitted.

**4** To disassemble the early-type variator, first remove the three screws and lift off the cover, then remove the O-ring and discard it, as a

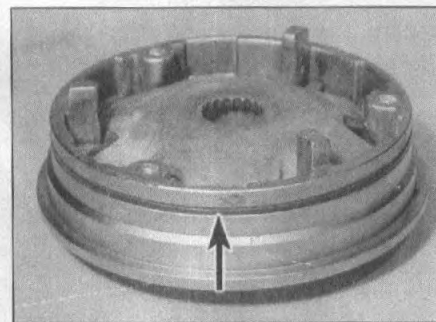
new one must be used (see illustrations). On all models, lift out the ramp plate, then remove the rollers, noting which fits where as, unless new ones are used, they should be installed in their original locations (see illustrations). Clean and, where applicable, degrease all the components.

**Inspection**

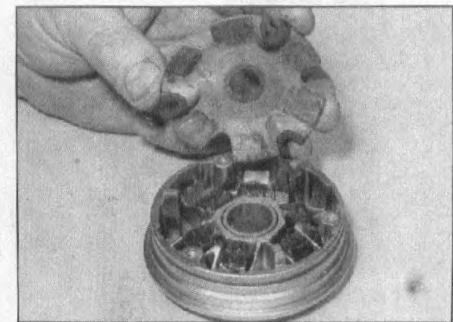
**5** Check the rollers and the corresponding ramps in the variator housing and ramp plate for damage, wear and flat spots, and renew the rollers, the housing and the plate if necessary (see illustration). Measure the diameter of the rollers and compare the result to the Specifications at the beginning of the Chapter. Renew the rollers as a set if any are worn below the minimum diameter (see illustration). **Note:** Always specify the model and year of your scooter when buying new variator rollers. If supplied, later non-greased rollers can be fitted in the earlier type variator,



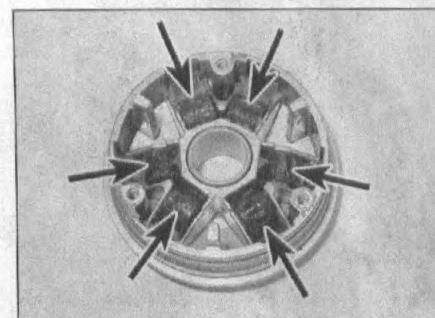
3.4b ... and lift off the cover



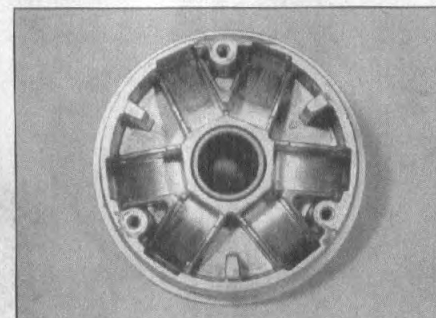
3.4c Discard the O-ring (arrowed)



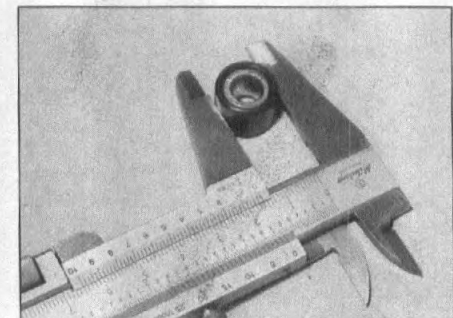
3.4d Lift out the ramp plate ...



3.4e ... and remove the rollers (arrowed)

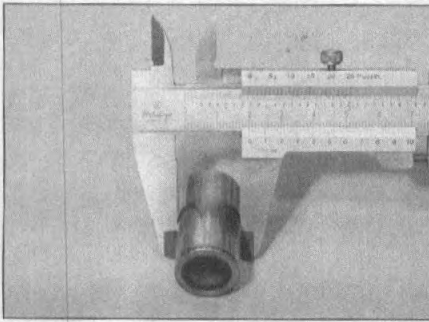


3.5a Check the ramps for wear

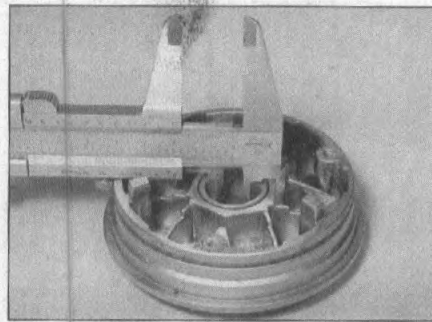


3.5b Measure the diameter of the rollers

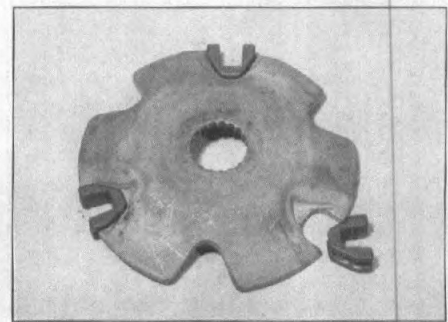




3.6a Measure the collar external diameter . . .



3.6b . . . and the bush internal diameter



3.7 Check the guide shoes and replace them if necessary

but the variator should be cleaned thoroughly and the rollers should not be greased.

6 Check the collar and its bush in the housing for wear and damage and renew them if necessary. Measure the external diameter of the collar and the internal diameter of the bush and compare the results to the Specifications at the beginning of the Chapter. Renew either or both if they are worn beyond their limit (see illustrations).

7 Check the condition of the guide shoes on the ramp plate and renew them if they are worn or damaged (see illustration). Also check the splines on the plate and renew the plate if they are worn.

### Installation

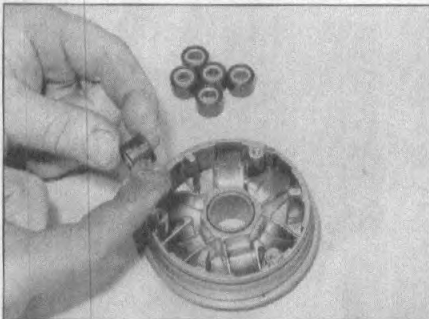
8 On early models fitted with the original rollers, grease the rollers and the ramps with

lithium soap-based grease (NLGI 3). On all models, fit the rollers into the housing, making sure they are fitted in their original positions (unless new ones are used) (see illustration). Check that the guide shoes are correctly fitted on the ramp plate, then install the plate (see illustration). On early models, if the original greased rollers are fitted, fit a new O-ring around the housing, then install the cover and tighten its screws securely (see illustrations 3.4c, 3.4b and 3.4a).

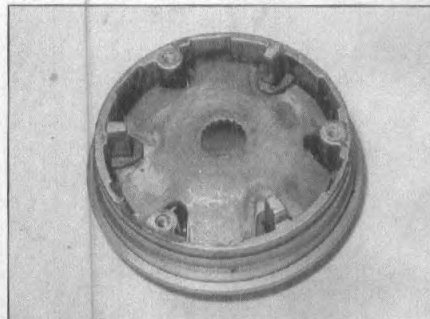
9 Grip the variator so that the ramp plate is held into the housing and slide the variator onto the crankshaft (see illustration). Install the collar, then fit the washer or spacer (see illustrations 3.3c and 3.3a or 3.3b). Note: If the ramp plate moves and the rollers are dislodged, disassemble the variator and reposition the rollers correctly.

10 Position the drivebelt around the shaft (see illustration), then fit the starter driven gear, the finned plate (where fitted) and the mating plate (see illustrations 3.2g, 3.2f, 3.2e, and 3.2d), making sure the mating plate is correctly located (see illustration). Fit a new nut and apply a suitable non-permanent thread locking compound to its threads. Use the method employed on removal to prevent the pulley turning and tighten the nut to the torque setting specified at the beginning of the Chapter (see illustrations 3.2a or 3.2b). If required, tighten the nut with a torque angle gauge (see illustration). Note: If a torque angle gauge is not available see Haynes Hint overleaf. Note: It is important the nut tightens against the mating plate, and does not bottom on the shouldered end of the crankshaft.

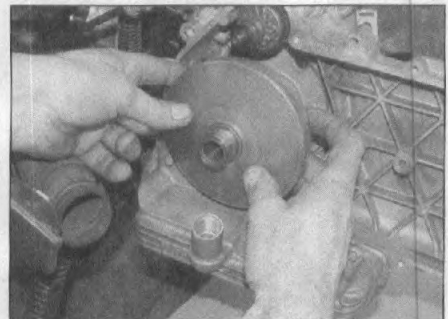
11 Install the drivebelt cover (see Section 2).



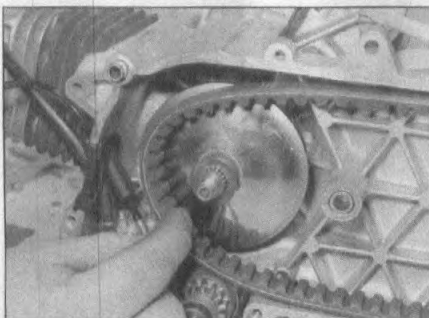
3.8a On early models, grease the rollers and fit them into the housing . . .



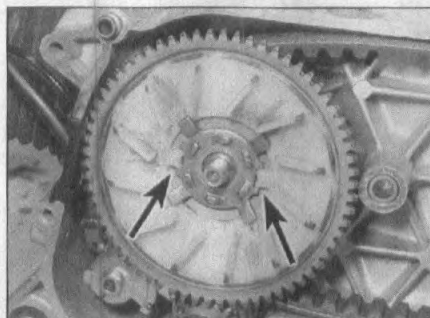
3.8b Fit the inner plate, locating the guide shoes as shown



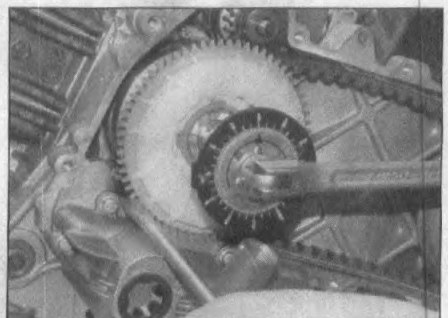
3.9 Hold the variator assembly together to keep the rollers in place



3.10a Locate the belt over the shaft



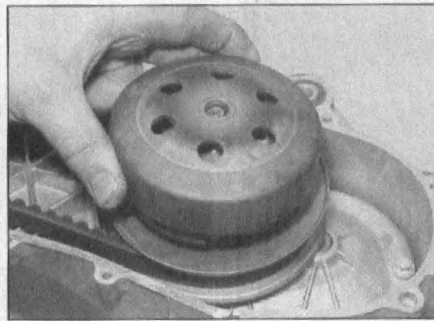
3.10b Make sure the tabs (arrowed) are correctly located



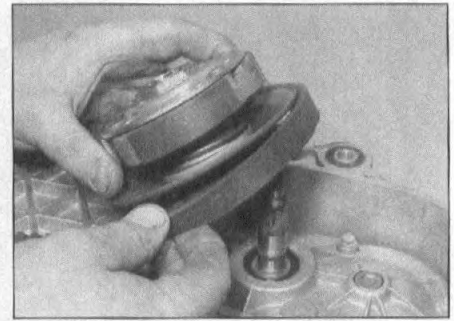
3.10c Tightening the nut with a torque angle gauge

**HAYNES  
HINT**

If a degree disc is not available, the angle for the torque setting can be determined by using the points on the nut. Select one point on the nut as a reference and mark it with paint or a marker. Now select the second point clockwise 90° from it and mark its position on the driven gear. Tighten the nut - when the mark on the nut aligns with the mark made on the gear, it will have turned through the requisite number of degrees.



4.3a Remove the clutch drum . . .



4.3b . . . then draw the assembly off the shaft and disengage the belt

**4 Clutch and driven pulley - removal, inspection and installation**



**TOOL TIP**

A holding tool can easily be made using two strips of steel bolted together in the middle, and with a bolt through each end which locate into the slots in the rotor.

**Removal**

1 Remove the drivebelt cover (see Section 2). On models where the gearbox input shaft passes through the belt cover, remove the spacer on the end of the shaft (see illustration 2.6b).

2 On early models, to remove the clutch drum nut it is necessary to hold the clutch and stop it from turning. Piaggio produce a service tool (Part No. 020565Y) for this purpose, or alternatively a home-made equivalent can be made (see **Tool Tip**). With the drum securely held, unscrew the nut (see illustration 4.12b). Piaggio recommend that a new nut is used on assembly.

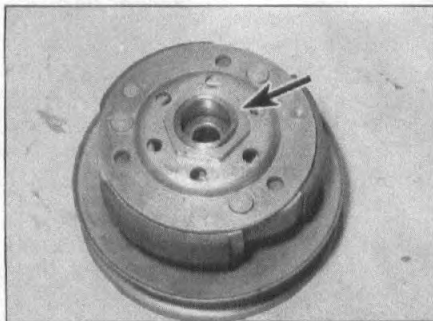
3 Remove the clutch drum, then draw the clutch/driven pulley assembly off the shaft and disengage the drivebelt from it (see illustrations).

4 To disassemble the clutch and driven pulley assembly, it is necessary to clamp the assembly against the pressure of the spring so that it does not fly apart when the clutch nut is unscrewed - the tool set-up described in Step 10 can be used. Alternatively, if an assistant is available, position the assembly on a bench and have the assistant press down hard on the

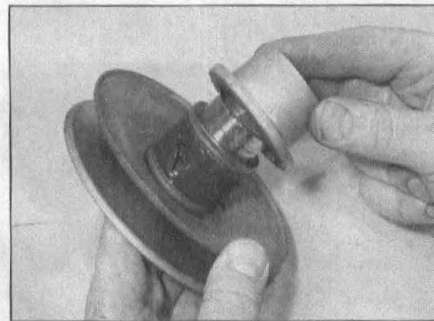
top of the clutch. With the assembly clamped or securely held, unscrew the nut (see illustration). Slowly release the clutch and allow the spring to expand, then remove the clutch, the upper spring seat, where fitted, and the spring. Remove the lower spring seat, then draw out the guide pins and separate the pulley halves (see illustrations). Remove the seal and the O-rings from the pulley outer half and discard them as new ones must be used (see illustration). Degrease and clean all components.

**Inspection**

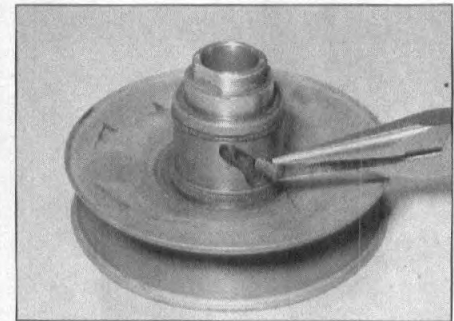
5 Check the inner surface of the clutch drum for damage and scoring; renew it if necessary. Measure the internal diameter of the drum at several points to determine if it is worn or out-of-round (see illustration). If it is worn or out-of-round beyond the limits, renew it.



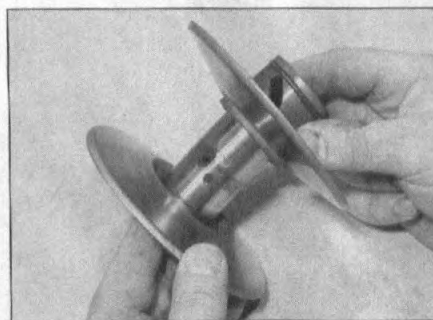
4.4a Press down hard on the clutch and unscrew the nut (arrowed)



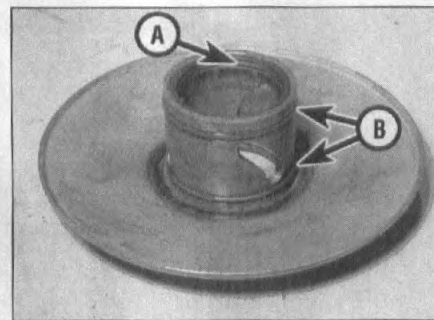
4.4b Remove the lower spring seat . . .



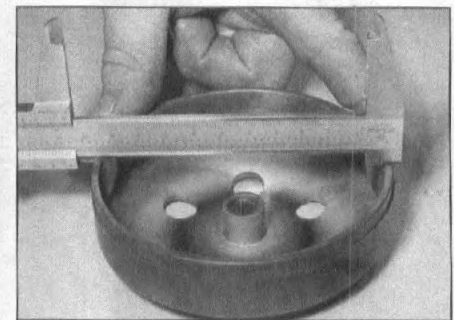
4.4c . . . then withdraw the pins . . .



4.4d . . . and separate the pulley halves

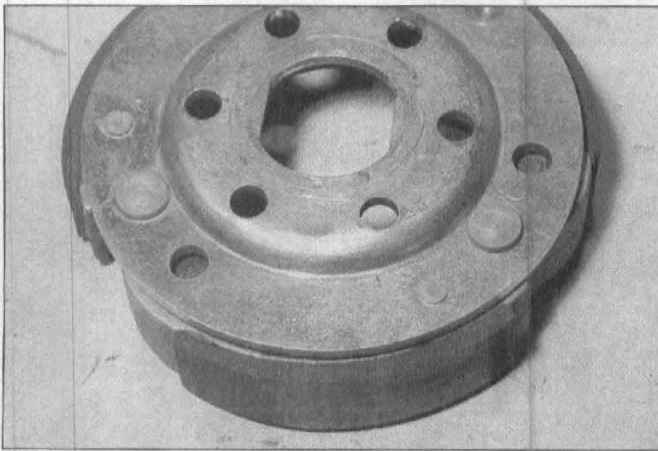


4.4e Lever out the seal (A) and remove the O-rings (B)

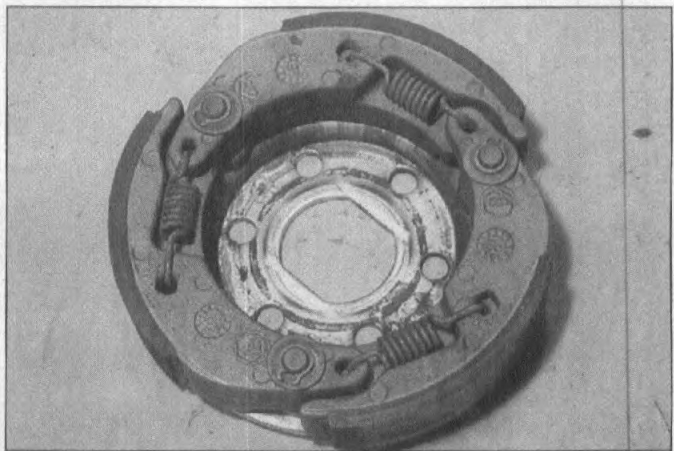


4.5 Measure the drum diameter





4.6a Check the friction material on the shoes . . .



4.6b . . . and check the springs and pivots

6 Check the amount of friction material remaining on the clutch shoes and renew the clutch if any shoe is worn to its limit (**see illustration**). Do not try to disassemble the clutch and renew any of the shoes individually because the clutch is balanced during manufacture, and will cause severe vibration if it becomes out of balance. Check the condition of the shoe springs and renew the clutch if any are weakened or broken, and check that the shoes are securely held on their pivots by the circlips (**see illustration**). Check that the shoes are not seized on their pivots by pressing them out with your hands or a screwdriver.

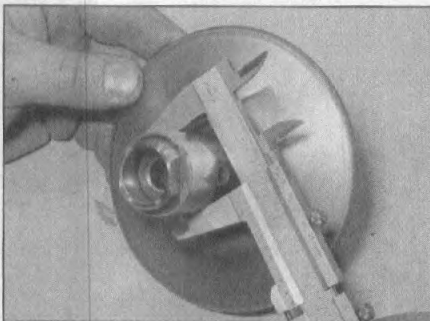
7 Check the pulley halves for any signs of damage and wear and renew them if necessary. Measure the external diameter of the inner pulley shaft and the internal diameter of the outer pulley bore and compare the results to the Specifications at the beginning of the Chapter. Renew either or both if they are worn beyond their limits (**see illustrations**). Also check the condition of the needle roller bearing in the inner pulley and renew it if necessary (**see illustration**). Drive out the old bearing using a suitable piece of tubing or a drift.

8 Check the condition of the spring. If it is bent or appears weak, renew it. Measure the

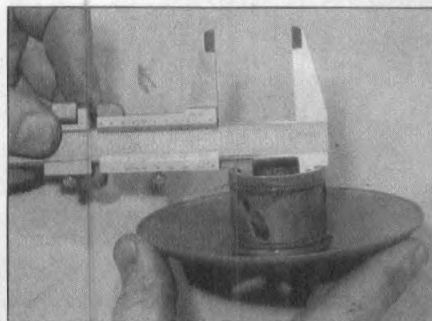
free length of the spring and compare it with the figure in the Specifications (**see illustration**). Renew the spring if it has sagged to less than the limit.

### Installation

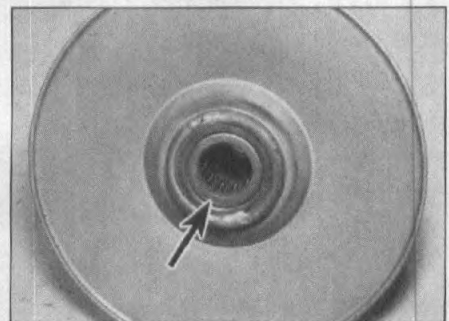
9 Fit a new seal and O-rings onto the outer pulley (**see illustration 4.4e**). Apply grease to the inner pulley shaft (**see illustration**). Fit the inner pulley shaft into the outer pulley bore, then fit the guide pins into their holes (**see illustrations 4.4d and 4.4c**). Apply some grease to the guide pin slots and around the O-rings (**see illustration**), then fit the lower spring seat (**see illustration 4.4b**).



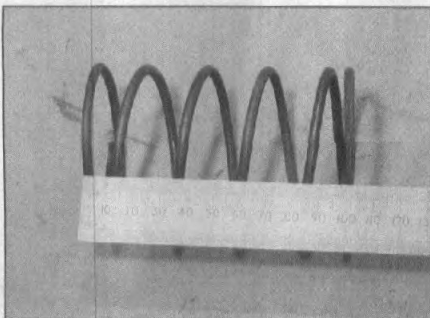
4.7a Measure the diameter of the inner pulley shaft . . .



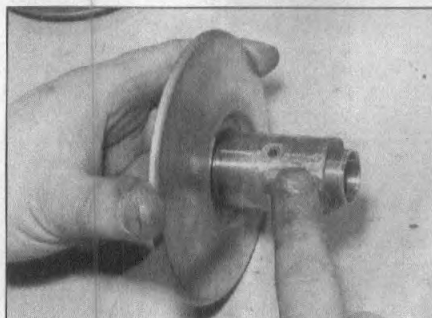
4.7b . . . and of the outer pulley bore



4.7c Check the needle bearing (arrowed) in the inner pulley



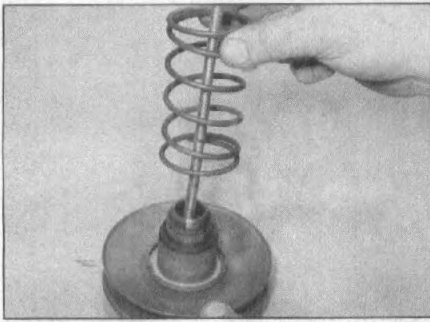
4.8 Measure the spring free length



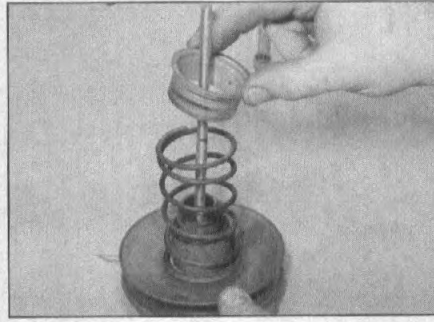
4.9a Apply grease to the inner pulley shaft



4.9b Apply grease to the slots and around the O-rings



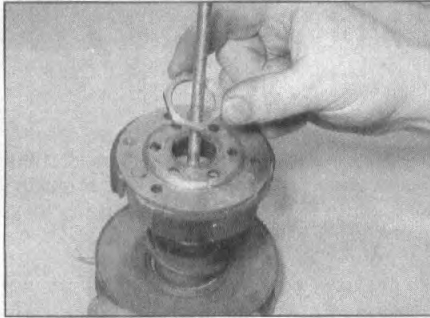
4.10a Fit the spring ...



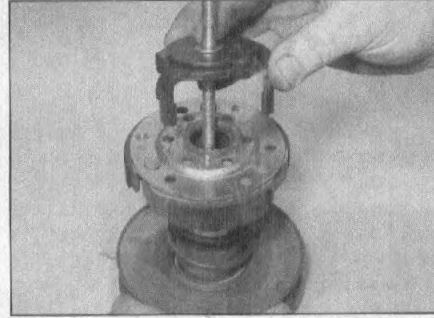
4.10b ... the upper spring seat (where fitted) ...



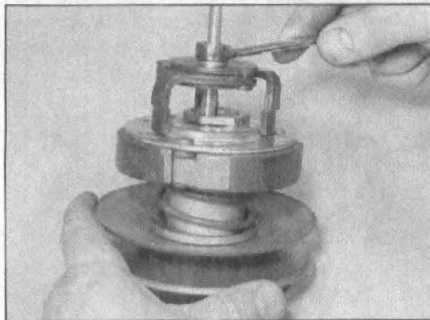
4.10c ... the clutch ...



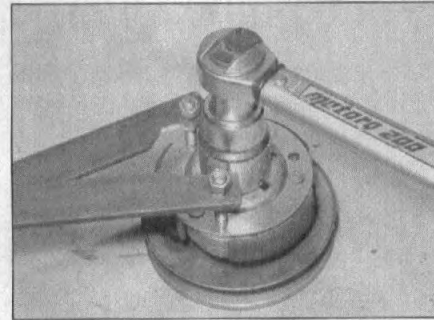
4.10d ... and the nut



4.10e Position the oil filter tool ...



4.10f ... and tighten the nut onto it to compress the spring



4.10g Hold the clutch as shown and tighten the nut to the specified torque

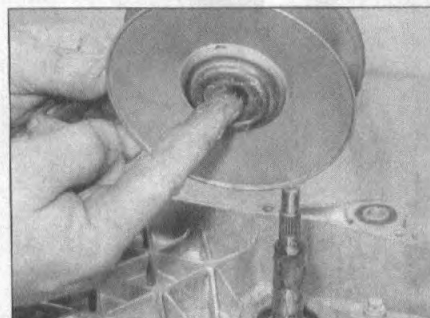
10 To assemble the clutch and driven pulley it is necessary to compress the spring and keep it compressed while the clutch nut is tightened. If an assistant is available, have

them press down on the clutch to compress the spring while you tighten the nut. Otherwise, a clamping tool can be made up using a piece of threaded rod and an oil filter removing tool

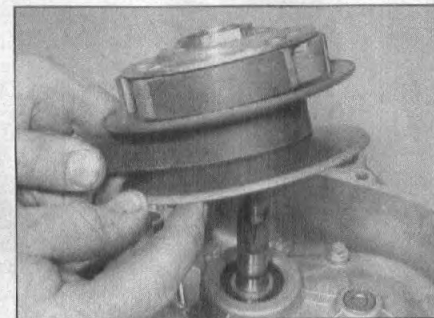
as follows: fit a washer and two nuts onto one end of the rod and tighten the nuts together. Pass the other end of the rod up through the pulley and locate the washer against the back of the inner pulley. Fit the spring, the upper spring seat (where fitted) and the clutch onto the pulley, then apply a suitable non-permanent thread locking compound to the clutch nut and rest the nut on top of the clutch (see illustration). Fit the oil filter removing tool with its legs down on the clutch, then thread a nut down the rod and onto the tool (see illustration). Tighten the nut, thereby compressing the spring, until the clutch nut threads are fully exposed and tighten the clutch nut as tight as possible by hand (see illustration). Remove the tool and the threaded rod, then hold the clutch with the tool used on removal and tighten the nut to the torque setting specified at the beginning of the Chapter (see illustration).

11 Apply some grease to the needle bearing in the inner pulley half and to the gearbox input shaft (see illustration). Engage the driven pulley with the drivebelt, then, if the drive pulley has not been removed, squeeze the belt to force the pulley halves apart, thereby providing some slack in the belt, and slide the assembly onto the shaft (see illustrations).

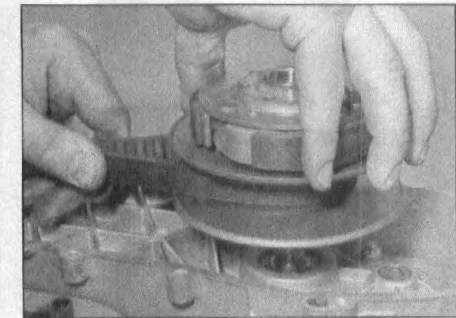
12 Fit the drum onto the clutch. On early models, apply a suitable non-permanent thread locking compound to the drum nut. Using the method employed on removal to prevent the clutch turning, tighten the nut to the specified torque setting (see



4.11a Grease the bearing and shaft ...

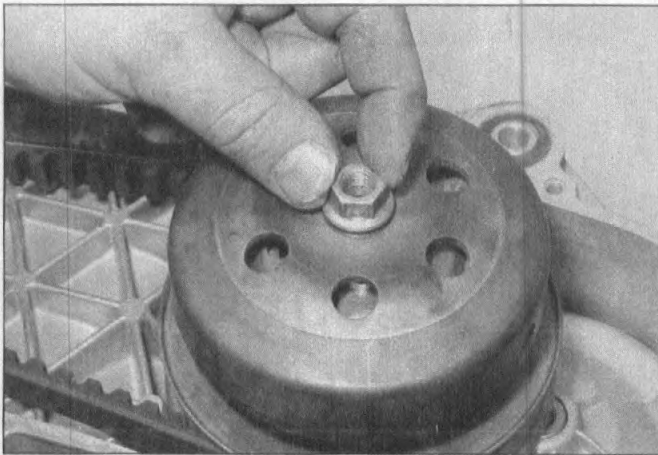


4.11b ... then squeeze the belt to part the pulleys if slack is needed ...



4.11c ... and fit the assembly onto the shaft





4.12a Fit the clutch drum and its . . .



4.12b . . . and tighten it to the specified torque

illustrations). On models where the gearbox input shaft passes through the belt cover, install the spacer on the end of the shaft (see illustration 2.6b).

13 Install the drivebelt cover (see Section 2).

### 5 Drivebelt and support roller – inspection and renewal



#### Inspection

1 Remove the drivebelt cover (see Section 2). Check along the entire length of the belt for

cracks, splits, frays and damaged teeth and renew the belt if any damage is found.

2 Measure the width of the outside of the belt and compare the measurement to the minimum width specified (see illustration). If the belt has worn below the limit, renew it.

3 The belt should be inspected regularly, according to the service interval (see Chapter 1).

**Note:** Oil or grease inside the casing will contaminate the belt and prevent it gripping the pulleys. Any evidence of oil inside the casing suggests a worn seal on either the crankshaft or the gearbox input shaft; evidence of grease suggests worn seals in the clutch centre.

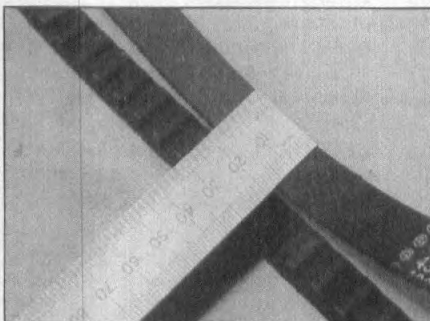
4 On GT200 models, a belt support roller is fitted midway between the variator and the clutch pulley (see illustration). Check that the roller turns smoothly and freely. If the roller centre bearing is worn or damaged, undo the centre bolt and remove the roller (see illustration). Remove the retaining circlip and press the bearing out from the back of the roller with a driver or suitably sized socket. Note which way round the bearing is fitted. Press the new bearing in with a socket that contacts the outer race only and secure it with the circlip.

#### Renewal

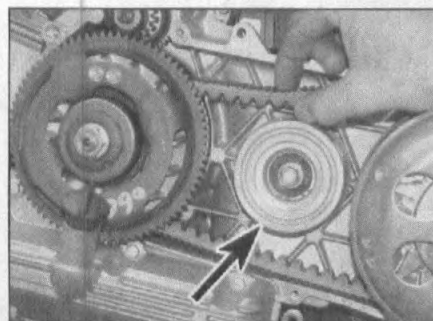
5 Follow the procedure in Section 3 and remove the starter driven gear. **Note:** Hold the variator in position on the crankshaft when the gear is removed to avoid dislodging the rollers. If the ramp plate moves and the rollers are dislodged, disassemble the variator and reposition the rollers correctly.

6 Lift the belt off the crankshaft and ease it out of the clutch pulley. If necessary, pull the outer clutch pulley half back against the spring tension and manoeuvre the belt out (see illustration).

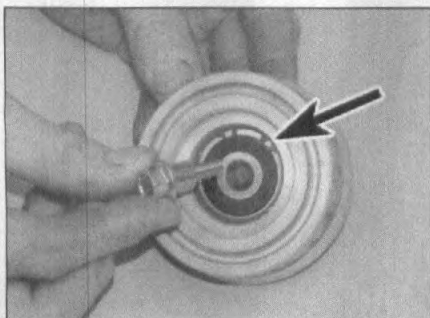
7 Fit the new belt, making sure any directional arrows point in the direction of normal rotation (see illustration). Ensure there is sufficient slack in the belt to avoid it



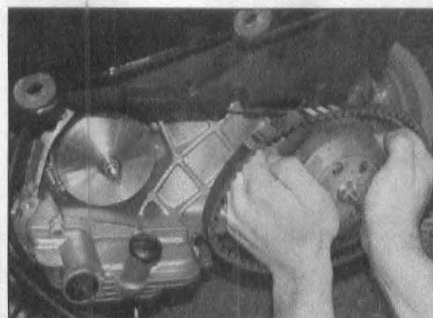
5.2 Measure the width of the belt to determine wear



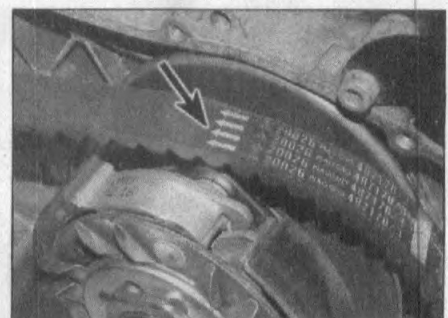
5.4a Location of the belt support roller (arrowed)



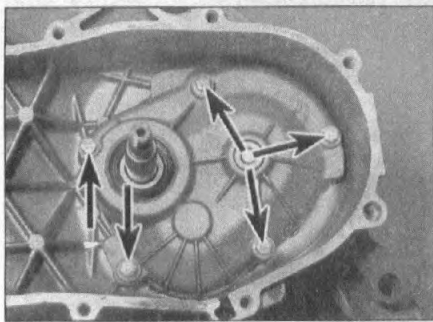
5.4b Roller is retained by centre bolt. Note the circlip (arrowed)



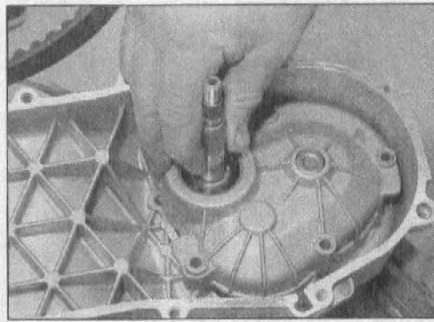
5.6 Compress the clutch to release the drivebelt



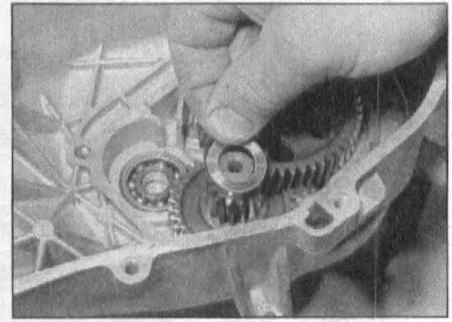
5.7 Arrows should point in the normal direction of rotation



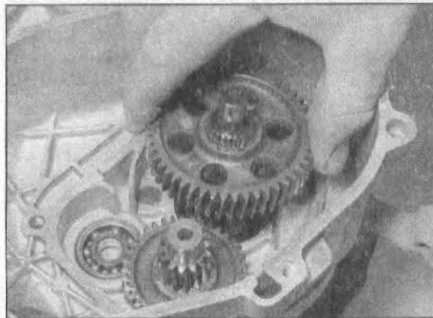
6.3a Undo the bolts (arrowed) ...



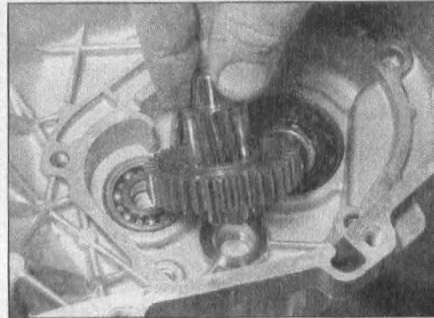
6.3b ... and remove the gearbox cover with the input shaft



6.4a Remove the outer thrustwasher ...



6.4b ... the output shaft ...



6.4c ... the reduction gear ...

being trapped when the starter driven gear is installed.

8 Install the starter driven gear (see Section 3) and the belt cover.

**6 Gearbox – removal, inspection and installation**



**Removal**

1 Remove the clutch and driven pulley (see Section 4) and the rear wheel (see Chapter 8).

2 Drain the gearbox oil (see Chapter 1).

**Gearbox cover behind clutch**

3 Unscrew the bolts securing the gearbox cover and remove the cover – the input shaft will come away with it (see illustrations).

4 Remove the outer thrustwasher from the reduction gear shaft, then lift out the output shaft, followed by the reduction gear, and remove the inner thrustwasher (see illustrations).

5 If required, drive the input shaft from the gearbox cover using a soft hammer on the shaft end, but note that the bearing and oil seal will have to be renewed if you do so. If there are no signs of oil leakage on the outside of the cover (behind the clutch), and if the shaft turns smoothly and freely with no signs of freeplay in the bearing or between the shaft and the bearing, it is better not to remove it, unless it is worn or damaged.

**Gearbox cover behind rear wheel**

6 Displace the disc brake caliper and remove the rear hub (see Chapter 8).

7 Unscrew the bolts securing the gearbox cover and remove the cover (see illustration). Note the location of the bolts – the three bolts on the right-hand side of the cover are shorter than the others. Note the location of the guides for the gearbox breather hose. Discard the gasket, as a new one must be fitted on reassembly.

8 Lift out the output shaft and the reduction gear. If required, press the input shaft out of its bearing in the transmission casing, but note that the shaft oil seal will have to be renewed if you do so (see Step 5).

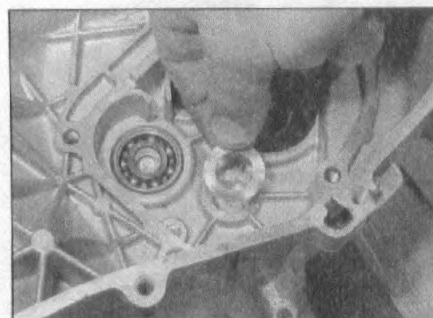
**Inspection**

9 Remove all traces of old sealant or gasket from the gearbox and cover mating surfaces, taking care not to nick or gouge the soft aluminium if a scraper is used. Wash all of the components in clean solvent and dry them off.

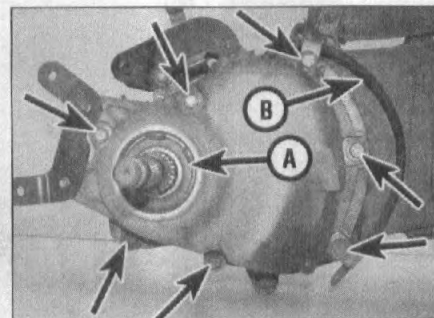
10 Check the gear teeth for cracking, chipping, pitting and other obvious wear or damage. Any pinion that is damaged must be renewed. Check the splines on the shafts for wear and damage.

11 Check for signs of scoring or bluing on the pinions and shaft. This could be caused by overheating due to inadequate lubrication. Renew any damaged pinions. On early models, remove the circlip securing the pinion on the output shaft and check the splines on both the shaft and the pinion for wear and damage (see illustration).

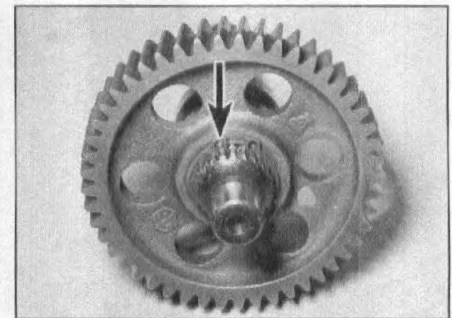
12 Check the thrustwashers where fitted and



6.4d ... and the inner thrustwasher

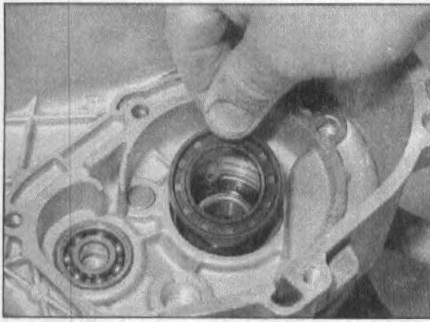


6.7 Undo the bolts (arrowed). Note the breather (B) and bearing circlip (A)

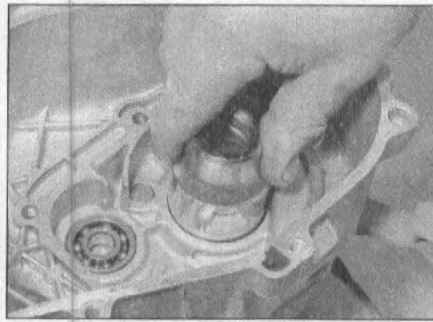


6.11 Remove the circlip (arrowed) and slide the pinion off the output shaft

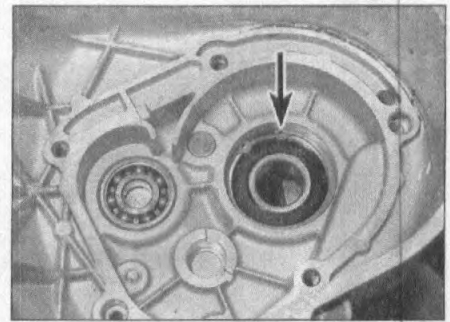




6.13a Lever out the seal . . .



6.13b . . . and drive a new one in using a socket



6.15 The output shaft bearing is secured by a circlip (arrowed)

renew them if they are bent or appear weakened or worn. Use new ones if in any doubt.

**13** Note which way round the output shaft oil seal is fitted, then lever it out and discard it, as a new one must be used (see illustration). After checking the bearing (Step 14), fit the new seal and drive it in using a seal driver or suitable socket, making sure it enters squarely (see illustration).

**14** Check that all the bearings turn smoothly and freely without excessive play between the inner and outer races. The bearings should be a tight fit in the casing; if a bearing is loose, and the casing is not damaged, use a suitable bearing locking compound to hold it in place. On some models the inner end of the output shaft runs in a needle bearing. Inspect the surface of the rollers for wear and pitting. Renew any bearing that is worn.

**15** To renew a bearing, first lever out the oil seal where fitted (see illustration 6.13a). If the bearing is secured by a circlip, remove the circlip (see illustration). Note the position of the bearing, then heat the cover using a hot air gun and drive the bearing out with a bearing driver or suitably-sized socket. Install the new bearing with a bearing driver or socket large enough to contact the outer race of the bearing. Install the circlip and new oil seal as required.

**16** Bearings fitted in blind holes require an internal bearing puller to extract them without

damaging the case; consult a Piaggio dealer or specialist motorcycle engineer if they need removing.

### Installation

#### Gearbox cover behind clutch

**17** Fit the inner thrustwasher, followed by the reduction gear, then the output shaft, and fit the outer thrustwasher onto the reduction gear (see illustrations 6.4d, 6.4c, 6.4b and 6.4a). If removed, fit the input shaft into the cover.

**18** Apply a suitable sealant, such as Loctite 501, to the cover mating surface, then fit the cover, making sure the dowels locate correctly (see illustration). Tighten the cover bolts evenly and in a criss-cross pattern to the torque setting Specified at the beginning of

the Chapter (see illustration). Ensure that the input and output shafts turn freely.

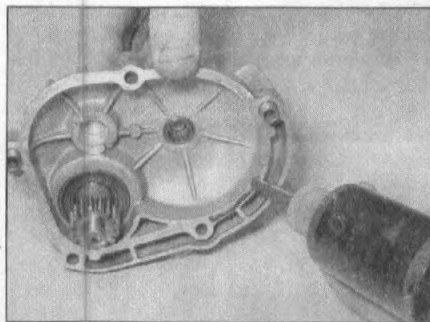
**19** Install the clutch and driven pulley (see Section 4) and the rear wheel (see Chapter 8).

**20** Fill the gearbox with the specified amount and type of oil (see Chapter 1).

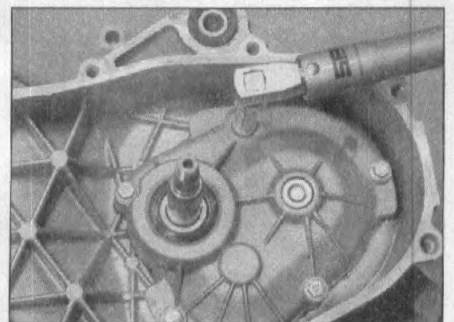
#### Gearbox cover behind rear wheel

**21** If removed, press the input shaft into its bearing, then install the reduction gear and the output shaft.

**22** Fit a new gasket over the dowels on the transmission casing, then fit the cover. Install the cover bolts with the guides for the breather hose (see Step 7). Tighten the cover bolts evenly and in a criss-cross pattern to the torque setting specified at the beginning of the Chapter. Ensure that the input and output shafts turn freely, then follow Steps 19 and 20.



6.18a Apply a suitable sealant . . .



6.18b . . . and tighten the cover bolts to the specified torque

